Visualisation for Sustainable Decision Making

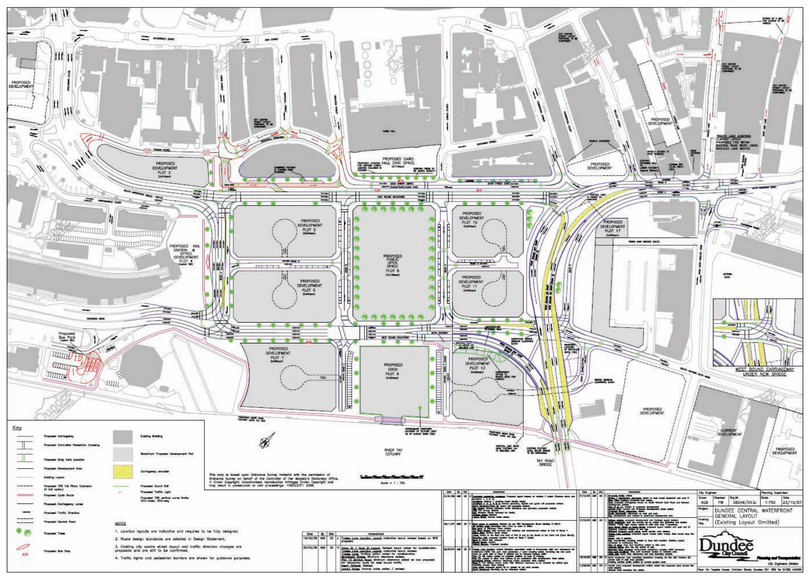
John Isaacs*, Ruth Falconer, David Blackwood, Daniel Gilmour
University of Abertay Dundee
* j.isaacs@abertay.ac.uk

Problem

Stakeholders cannot make informed decisions about the sustainability of urban environments as they are unable to fully understand the complex interactions between the different aspects of sustainability and so are unable to fully recognise the consequences of the decisions they make.

Current Practice

Tools to support the decision process are commonplace but are dominated by the perceptions of the "expert" decision makers (e.g. planners, architects, and design engineers). Many stakeholders, especially the general public, have no access to these tools and even if they did would have no idea about how to use them. Public consultation is usually performed through the use of simple 2d plans or static 3d renders which do not provide an in context representation of the planned development.



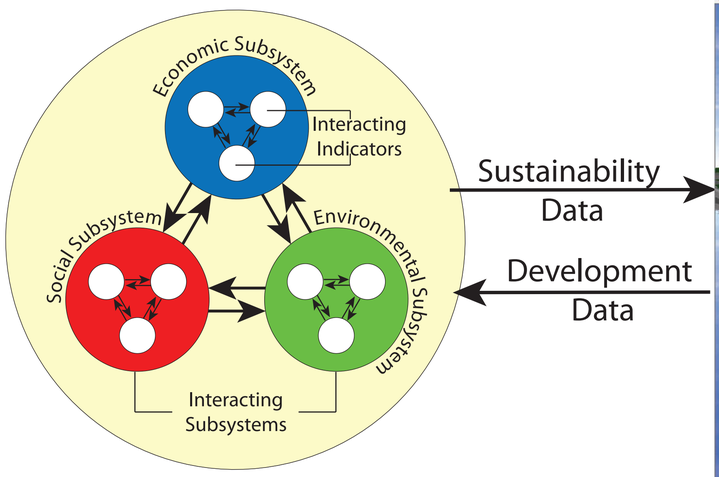
Project Aims

- Create a decision support tool that can be used by every stakeholder regardless of background or experience.
- Convey complex information about urban sustainability in an accessible way.
- Allow all stakeholders to realise the consequences of alternative courses of action.
- Allow the sustainability of an environment to be assessed over time.
- Effectively model the interactions between all the aspects of sustainability.

Initial Results

The pilot tests performed to date show that the majority of participants can use S-City VT to extract sustainability information, thus making the complex decision making process of sustainability more transparent to the general public. Tests were conducted to assess if differences in relative sustainability could be determined for different scenarios. This proved to be successful and participants were also able to determine which indicators were the cause of differences in sustainability using the weaving technique.

Our Methodology



Sub Models

Virtual Environment

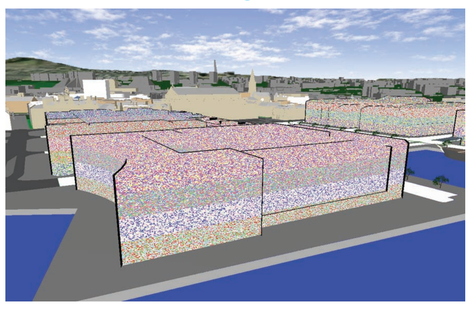
S-City VT is separated into three sections: the sub models that describe the interdependency between the indicators; the analytical network process (ANP) methodology that outputs priorities for the indicator set based on stakeholder's opinions and the 3D visualization which combines the sustainability results derived from the sub and ANP models with a 3D representation of the urban development. The visualisation tool employs a number of visualization techniques to display the sustainability results to the stakeholders. The creation of a 3-D virtual environment allows stakeholders to be immersed in the development. By projecting the sustainability results onto a virtual representation of the proposed development, S-City VT allows the user to immediately envisage the consequences of any decisions made, and the differences in specific scenarios, over time.

Visualisation Techniques

Colour Blending

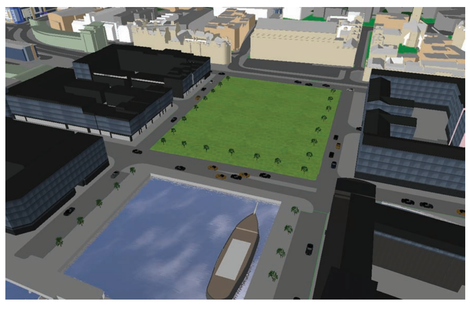
Blending is the combination of all indicators from each of the economic, social and environmental subsystems resulting in a single sustainability value. Each element (building, road, water) in the development has a sustainability value which is mapped onto a colour scale using a colour map. The tool allows users to select from a variety of colour maps best known for their discriminating abilities.

Colour Weaving



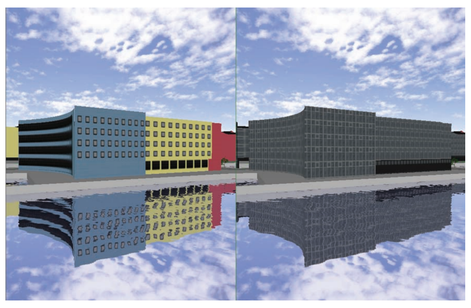
Rather than combining all the indicators into a single value it may be possible to preserve some of the underlying sustainability information so that indicators that are very unsustainable or very sustainable can be identified. The weaving technique uses a different colour map per indicator, the intensity of the colour defines that indicators sustainability. Intense colours represent indicator values that have very low relative sustianability.

Animation



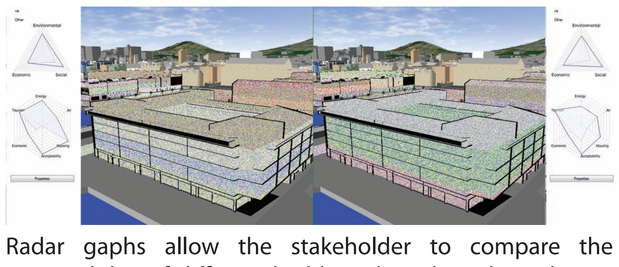
The blending and weaving techniques provide the stakeholders with an abstract view of the sustainability data on a representation of the development. However some stakeholders, especially the general public, may not be able to determine what these colours represent. Animation provides an important method of providing users with a metaphorical representation they will immediately understand. In this case cars are used to represent traffic density.

Split Screen



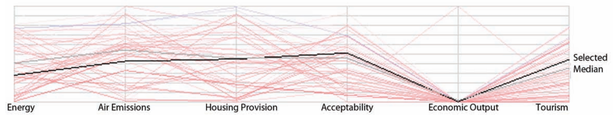
While the methods detailed allow the sustainability of a building or development to be determined, they do not in themselves allow the user to compare alternate courses of action. A split screen rendering approach has been adopted which allows the user, using any of the techniques, to compare two scenarios sides by side throughout the life cycle of the development. The image on the right shows a comparison between a predominately brick and a predominately glass building.

Radar Graphs



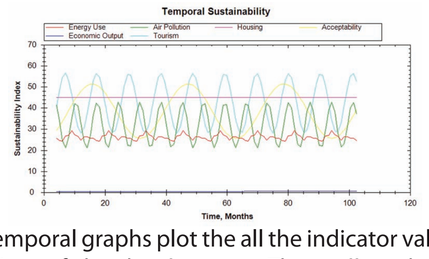
Radar gaphs allow the stakeholder to compare the sustainability of different buildings based on the indicator values. The shape, size, colour and point values will be different for each building allowing a detailed comparison.

Parallel Coordinates



Parallel coordinates allow the user to compare all indicator values for all the buildings in a scenario. Buildings can be selected and their trace in the graph is highlighted. The colours in the graph correspond to those in the blending technique

Temporal Graphs



Simple temporal graphs plot the all the indicator values over the life time of the development. These allow the user to identify the interconnectivity of the indicators and to identify where and why sudden changes occur.

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S-city VT
Sustainable City Visualisation Tool
www.scityvt.co.uk

WhSpR
White Space Research